

CASA IMMUNIZATION COVERAGE SURVEY

2002



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ACRONYMS

4-3-1-3-3	4 doses of DTP, 3 doses of Polio, 1 dose of MMR, 3 doses of Hib, and 3 doses of HepB vaccines
3-2-2-2	3 doses of DTP, 2 doses of Polio, 2 doses of Hib, and 2 doses of HepB vaccine
AAP	American Academy of Pediatrics
ACIP	Advisory Committee on Immunization Practices
CASA	Clinic Assessment Software Application
CDC	Centers for Disease Control and Prevention
CII	National Childhood Immunization Initiative
DTP3	3 doses of diphtheria, tetanus, and pertussis vaccine
DTP4	4 doses of diphtheria, tetanus, and pertussis vaccine
HepB2	2 doses of hepatitis B vaccine
HepB3	3 doses of hepatitis B vaccine
Hib2	2 doses of <i>Haemophilus influenza</i> type b vaccine
Hib3	3 doses of <i>Haemophilus influenza</i> type b vaccine
KDHE	Kansas Department of Health and Environment
MMR1	1 dose of measles, mumps, and rubella vaccine
MOGE	Moved out of the area or going elsewhere for health care
NIS	National Immunization Survey
Polio2	2 doses of polio vaccine
Polio3	3 doses of polio vaccine
PHS	Public Health Services
VAR1	1 dose of varicella vaccine

CASA 2002 EXECUTIVE SUMMARY

Coverage rates of children two years of age in 2002 were assessed at all 105 local health departments to see whether Kansas reached the 90% coverage goals set by the Centers for Disease Control and Prevention (CDC) and the National Childhood Immunization Initiative (CII). Immunization coverage rates in the two-year old cohort were measured for 4 doses of diphtheria, tetanus, and pertussis (DTP4), 3 doses of polio (Polio3), 1 dose of measles, mumps, and rubella (MMR1), 3 doses of *H. influenzae* (Hib3), 3 doses of hepatitis B (HepB3), and 1 dose of varicella (VAR1). The combination of DTP4, Polio3, MMR1, Hib3, and HepB3 (4-3-1-3-3) was analyzed as well. In order to identify non-immunized and under immunized children sooner, one-year old children were also included in this assessment. Evaluation of coverage rates for the one-year old children in 2001 included the following: 3 doses of diphtheria, tetanus, and pertussis (DTP3), 2 doses of polio (Polio 2), 2 doses of *H. influenzae* (Hib2), 2 doses of hepatitis B (HepB2), and the combination of DTP3, Polio2, Hib2, and HepB2 (3-2-2-2).

For the children in the two-year old cohort, the numbers of local health departments achieving the 90% coverage goal were similar or slightly increased for Polio3, MMR1, Hib3, and HepB3 compared to the 2001 CASA. However, the number of counties with at least 90% coverage decreased by 10 for the 4-3-1-3-3 combination. Mean coverage rates remained the same this year for all single antigens except DTP4 and for 4-3-1-3-3. Coverage rates for DTP4 decreased by ten percentage points from 86.2% in 2001 to 74.8% in 2002. In March 2001, CDC recommended vaccine providers to defer the fourth dose of DTP if they had an insufficient supply to vaccinate infants with the first three doses.¹ The same is true for the 4-3-1-3-3 combination, which dropped from 83.9% to 74.8% this year. On the other hand, mean coverage rates for Polio3, MMR1, Hib3, and HepB3 achieved the goal of at least 90%.

For the one-year old cohort in 2002, the statewide mean coverage rates decreased slightly compared to the statewide mean coverage rates from the previous year. For Polio2, Hib2, and HepB2 mean coverage rates bettered 90% and DTP2 and the 3-2-2-2 combination, mean coverage rates were greater than 80%.

Coverage rates were also evaluated at the interim time points of 3, 5, 7, 9, 12, 16, 19, and 21 months of age. For both age cohorts, 80% were up-to-date for their immunizations at age of 3 months. However by 7 months of age, coverage rates decreased by 30 percentage points. Then at 12 months of age, the coverage rates increased to levels similar the coverage rates at 3 months of age. However, in the two-year old cohort, coverage rates decreased again at 16 months of age but rose until 24 months of age when at least 75% of the children are fully immunized.

Children who start their immunization series on time were compared to children who started late. In the two-year old cohort, children who started on time were 1.9 times more likely to complete the series by 24 months of age than those who started late. At two-years of age 16% of the children only need one immunization in order to be up-to-date. For those children requiring just one immunization, 88% were missing DTP4. In the one-year old cohort, children who started the immunization series on time were 2.1 times more likely to be up-to-date at 12 months of age than those who started late.

¹Update on the Supply of Tetanus and Diphtheria Toxoids and of Diphtheria and Tetanus Toxoids and Acellular Pertussis Vaccine. MMWR 2001;50:189-190.

BACKGROUND

Immunization of children against nine diseases has proven effective in reducing the morbidity and mortality of those diseases. For this reason, the Centers for Disease Control and Prevention (CDC) and the National Childhood Immunization Initiative (CII) have set goals of 90% immunization coverage for all children by their second birthday of the following single antigens and a combination of all vaccines: 4 doses of diphtheria, pertussis, and tetanus vaccine (DTP4); three doses of polio vaccine (Polio3); one dose of measles, mumps, and rubella vaccine (MMR1); three doses of *Haemophilus influenzae* type b vaccine (Hib3); three doses of hepatitis B vaccine (HepB3); and 1 dose of varicella (VAR1). The combination of DTP4, Polio3, MMR1, Hib3, and HepB3 is referred to as the 4-3-1-3-3 combination.

Even though no immunization coverage goals for one-year old children have been established, children are expected to have received the following immunizations by their first birthday: 3 doses of diphtheria, pertussis, and tetanus vaccine (DTP3); two doses of polio vaccine (Polio2); two doses of *Haemophilus influenzae* type b vaccine (Hib2); and two doses of hepatitis B vaccine (HepB2). The complete set is referred to as the 3-2-2-2 combination vaccine. One-year old children were included in this assessment in order to identify non-immunized and under immunized children sooner and increase the possibility of these children receiving all immunizations by their second birthday.

The field staff at the Immunization Program from Kansas Department of Health and Environment assessed immunization levels of both two-year old, and one-year old children at all local health departments. The assessments included in this study were conducted between January 1, and December 31, 2002.

METHODS

Using the Clinic Assessment Software Application (CASA) designed by the CDC, immunization coverage rates were evaluated at all local health departments for children either one-year old or two-years old. The one-year old cohort included all children between the ages of 12 and 23 months and the two-year old cohort included all children between the ages of 24 and 35 months based on the date of assessment. Children were excluded if they were documented as having moved out of the area or gone elsewhere for health care (MOGE). For local health departments with 100 or fewer eligible records all records were examined. For local health departments with a larger number of records, either a listing of eligible children was generated and then a random sample of at least 100 records was chosen and examined or all records were examined if the local health department had the capabilities.

At the local health departments, coverage rates for DTP4, Polio3, MMR1, Hib3, HepB3, VAR1 and the 4-3-1-3-3 combination were examined for the two-year old cohort. For the one-year-old cohort, coverage rates for DTP3, Polio2, Hib2, HepB2, and the 3-2-2-2 combination were evaluated at each local health department. Results and explanations of the immunization assessment were given to each local health department. The local health departments were also provided with a list of all children from the sample that were not up-to-date for immunizations or were considered as a missed opportunity in order to help the health departments identify the children who still needed at least one vaccine. A child is considered as a missed opportunity if he/she visits the health department for any reason and does not receive all of the eligible immunizations.

Following an assessment at the local health department, immunization field staff discussed potential areas for improvement in management of the immunization clinic. Procedural changes such as changes in personnel, record keeping, tracking patients, and reminder/recall system were evaluated in order to better assess the changes on coverage rates. Factors that affect changes on coverage rates include implementation of computerized tracking system, new recall/reminder system, method of classifying children who had moved or gone elsewhere (MOGE), and change of immunization personnel. Each health department received an overall review of their immunization coverage rates with suggestions for increasing coverage rates.

Additional analysis using SAS 8.2 was performed on the aggregate data from all health departments. The percentage of local health departments achieving the 90% immunization coverage goal was examined for the two-year-old cohort. These results were compared to immunization rates for 2001 in order to determine increases or decreases in coverage rates over time.

Data from all health departments were combined and analyzed for mean, median, and range for single vaccines and combinations. Also the percent of children up-to-date for immunization at interim months of age were computed for each cohort.² For both cohorts, the interim months of age used were 3, 5, 7, 9 and 12 and the additional months of 16, 19, 21 and 24 were examined for the two-year old cohort.³ The interim points of 3 and 24 months of age were used to assess the number of children that started their immunization series either on time or late and the number that finished on time or late for the two-year old cohort. Children who had received all necessary immunizations by the appropriate age were defined as on time and those who were missing at least one immunization recommended for that age were defined as late. The children late at 24 months were further examined to determine how many more immunizations they needed in order to be up-to-date. For the one-year old cohort, the interim points 3 and 12 months were used instead.

Also, counties were grouped together based on their population density. Mean immunization coverage rates were compared among these groups. The population densities were predetermined in the 2001 Annual Summary of Vital Statistics⁴. Counties, which were originally classified as Frontier or Rural, were now classified as “sparsely populated”. Counties, which were originally classified as Densely-Settled Rural and Semi-Urban, were now classified as “moderately populated”. And counties, which were classified as Urban, remained the same.

²Statewide rates of immunization coverage were calculated by combining all children in the samples obtained from all counties. Each county's sample is obtained independently from all other counties' samples, and each sample represents a proportion of children which is different from county to county. Statewide rates calculated in this way may be inaccurate, and may not represent the rate that would be found if one probability sample was selected for the whole state, or if each county sample received an appropriate weight during the analysis. The only purpose of the calculation presented in this document is to allow comparisons at different ages, not to make inference on the true statewide rate for any age groups.

³Appropriate immunizations were based on the 2002 ACIP recommendations. MMWR 2002;51:7-10.

⁴ <http://www.kdhe.state.ks.us/hci/as01/as2001.html>

RESULTS

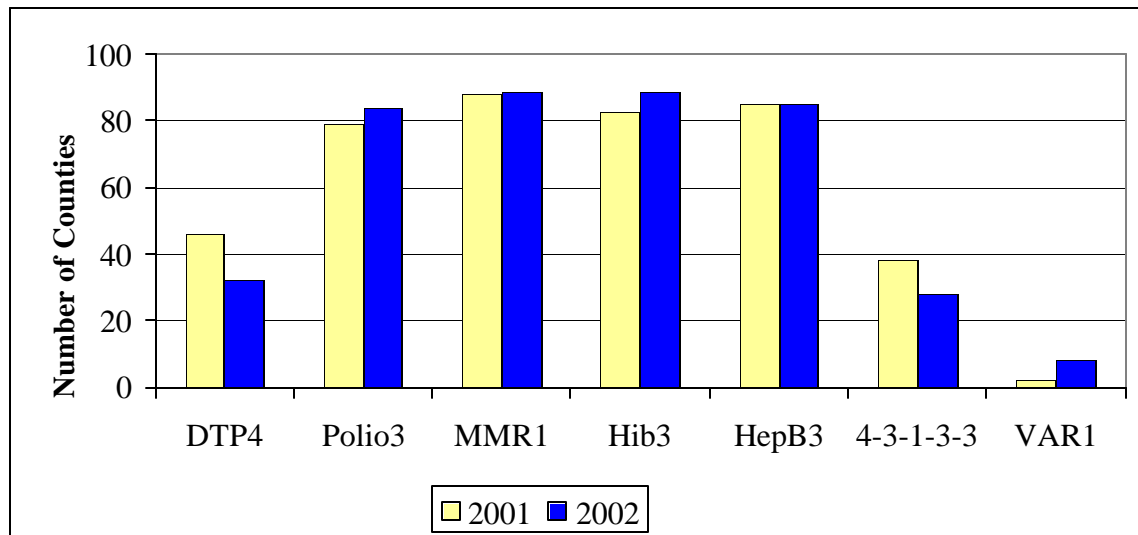
For the two-year old cohort, 9559 records were reviewed with a range of 9 to 963 records from 105 individual counties. The mean number of records examined for the two-year old cohort was 91 with a median of 50 records per county. For the one-year old cohort, 9548 records were reviewed with a range of 3 to 1074 records from 105 counties. In the one-year old cohort, a mean of 91 records and a median of 48 records per county were examined.

TWO-YEAR OLD COHORT

Counties Achieving the 90% Goal

The immunization coverage rate goal is 90% or better for single vaccines and for preset combinations of vaccines. The number of local health departments achieving 90% or better coverage increased the greatest for Hib3 (Figure 1). The number of local health departments with at least 90% for VAR1 increased four-fold from two counties to eight counties. The number of counties with at least 90% coverage for DTP4 decreased from 46 counties in 2001 to only 32 counties in 2002. As a result of this decrease, only 28 counties had 90% or better coverage for the 4-3-1-3-3 combination.

FIGURE 1: Number of County Health Departments in Kansas Achieving 90% Immunization Coverage for Single Vaccines in the Two-Year Old Cohort for 2001 CASA and 2002 CASA.



Statewide Mean, Median, and Range of Immunization Rates for Single and Combination of Vaccines

In the two-year old cohort, the statewide mean coverage rates for all single vaccines except for DTP4 have remained the same compared the 2001 CASA report. The mean coverage rates exceed the coverage goal of 90% for Polio3, MMR1, Hib3, and HepB3 (Table 1). The mean coverage rates for DTP4 and 4-3-1-3-3 decreased by almost 10 percentage points each. The median, or value that half of the counties meet or exceed, was also similar to the median values of the 2001 CASA for all Polio3, MMR1, Hib3, and HepB3. Despite coverage rates remaining similar to those in 2001, an

increase of variability among local health departments was seen in the widening of the range of immunization coverage rates. The variability of coverage rates among local health departments increased for DTP4, Hib3, HepB3, VAR1, and 4-3-1-3-3 combination.

TABLE 1: Immunization Coverage Rate Mean, Median, and Range for Two-Year Old Cohort at County Health Departments in Kansas for the 2002 and 2001 CASA.

	2002			2001		
Vaccine	Mean	Median	Range	Mean	Median	Range
DTP4	76.2%	80.0%	23.1-100%	86.2%	88.9%	47.2-100%
Polio3	96.1%	97.4%	62.1-100%	93.0%	95.3%	54.7-100%
MMR1	94.2%	94.7%	58.0-100%	94.2%	96.0%	58.5-100%
Hib3	94.2%	95.4%	66.5-100%	94.2%	95.4%	72.5-100%
HepB3	93.4%	95.0%	59.4-100%	94.1%	95.3%	71.3-100%
4-3-1-3-3	74.8%	77.4%	23.1-100%	83.9%	86.8%	45.3-100%
VAR1	64.1%	70.0%	4.5-96.8%	60.0%	64.0%	10-93.7%

Counties were grouped together based on their population density. Mean immunization coverage rates of the counties were compared among these groups (Table 2). Compared to the mean coverage rates of the other two groups of counties, the mean coverage rates for the “moderately populated” counties was lower for all vaccines and for the 4-3-1-3-3 combination. This trend was different than the trend seen in the 2001 CASA. In the 2001 CASA, mean immunization coverage rates for the “moderately populated” and “urban” counties were similar and both groups had lower mean immunization coverage rates than the “sparsely populated” counties.

TABLE 2: Mean Immunization Coverage Rate Among Counties Based on Population Density for the Two-Year Old Cohort in Kansas for 2002.

Vaccine	Sparsely Populated	Moderately Populated	Urban
DTP4	78.5%	71.3%	80.0%
Polio3	95.6%	90.5%	91.7%
MMR1	96.2%	90.0%	91.8%
Hib3	95.5%	91.7%	92.1%
HepB3	94.5%	91.3%	91.1%
4-3-1-3-3	77.1%	69.5%	76.3%
VAR1	68.9%	51.7%	70.6%

Mean Immunization Rates at Interim Time Points

Mean immunization coverage rates were examined at interim month time points. The immunizations needed at each time interval are listed in Table 3. At 3 months of age, the mean coverage rate was 82.1% (Figure 2). Immunization coverage rates decreased by 30 percentage points by 7 months of age. Then at 12 months of age, immunization coverage rates recovered to

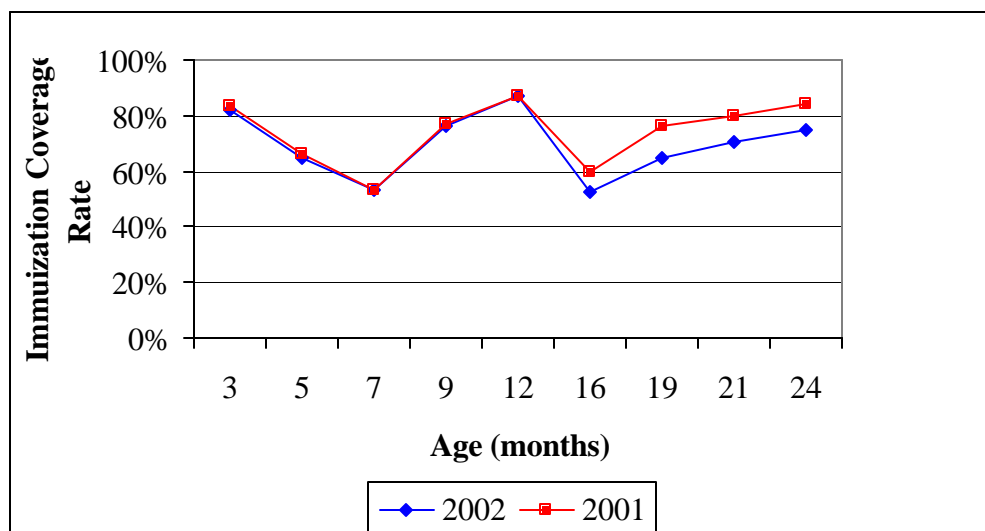
87%. The same pattern was repeated again with a large decrease of 34 percentage points at 16 months. By 24 months of age, the coverage rates of the children in the two-year old cohort had not returned to the same coverage rates as 3 months of age. In 2001 CASA, however, coverage rates at 24 months of age did recover to rates similar to those at 3 months of age.

TABLE 3: Recommended Vaccines at Selected Time Points and Combined Immunization Coverage Rates for Two-Year Old Cohort in Kansas for 2002 and 2001.

AGE	ANTIGEN	2002	2001
3 months	DTP1, Polio1, Hib1, HepB1	82.1%	83.1%
5 months	DTP2, Polio2, Hib2, HepB2	64.5%	65.9%
7 months	DTP3, Polio2, Hib2, HepB2	53.0%	53.2%
9 months	DTP3, Polio2, Hib2, HepB2	75.9%	77.3%
12 months	DTP3, Polio2, Hib2, HepB2	86.7%	87.0%
16 months	DTP4, Polio3, Hib3, HepB3, MMR1	52.6%	59.5%
19 months	DTP4, Polio3, Hib3, HepB3, MMR1	65.0%	76.0%
21 months	DTP4, Polio3, Hib3, HepB3, MMR1	70.6%	80.0%
24 months	DTP4, Polio3, Hib3, HepB3, MMR1	74.8%	83.9%

* Vaccines in bold type denote new vaccine for that time interval.

FIGURE 2: Mean Immunization Coverage Rates for Two-Year Old Cohort in Kansas at Selected Time Intervals for 2002 CASA and 2001 CASA.

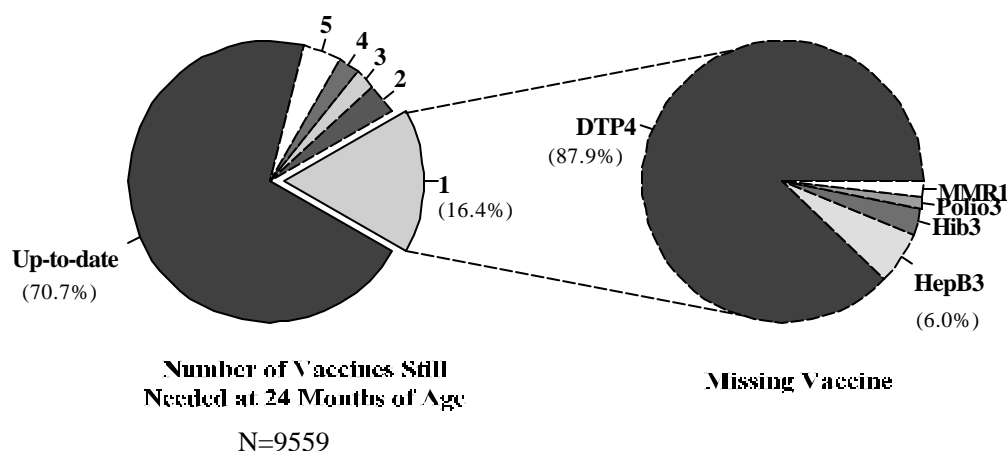


The likelihood of being up-to-date on all immunizations by 24 months of age depending on the up-to-date status at 3 months of age was also examined. At three months of age, 7693 children were up-to-date for DTP1, Polio1, Hib1, and HepB1. Of those children who started on time at 3 months, 78% (5982 children) had completed all necessary immunizations (DTP4, Polio3, Hib3, HepB3, and MMR1) on time by 24 months of age. However, only 41% (774) of the children who were late at 3 months of age completed all immunizations by 24 months of age. **This means that children who**

start on time are 1.9 times more likely to complete the series on time by 24 months of age compared to those children who do not begin the series on time. ($p < 0.001$)

At 24 months of age, 2803(29%) of all two-year olds were behind schedule. Of those children, 1570 needed only one more immunization in order to be up-to-date. Of those children needing just one immunization, 88% (1380) needed DTP4 in order to be up-to-date (Figure 3).

FIGURE 3: Number and type of immunization needed in order to be up-to-date at 24 months of age.



One-Year Old Cohort

Mean, Median, and Range of Statewide Immunization Rates for Single Vaccines and Combination of Vaccines

Mean coverage rates for Polio2, Hib2, and HepB2 exceeded 90% coverage (Table 4). Compared to the one-year old cohort in 2001, the mean immunization coverage rates decreased slightly for all vaccines and the 3-2-2-2 combination of vaccines. Along with the slight decrease in mean coverage rates, the variability of the coverage rates among the counties widened.

TABLE 4: Immunization Coverage Mean, Median, and Range for One-Year Old Cohort at County Health Departments in Kansas for the 2002 and 2001 CASA.

Vaccine	2002			2001		
	Mean	Median	Range	Mean	Median	Range
DTP3	83.3%	86.0%	50-100%	85.2%	88.1%	53.6-100%
Polio2	92.5%	95.2%	50-100%	93.1%	95.9%	62.2-100%
Hib2	92.4%	95.2%	50-100%	93.2%	96.1%	65.2-100%
HepB2	93.1%	95.4%	50-100%	93.3%	95.6%	63.7-100%
3-2-2-2	82.0%	85.0%	48.8-100%	83.7%	86.3%	53.6-100%

Mean immunization coverage rates were greater for all single vaccines and for the 3-2-2-2 combination in the “sparsely populated” counties compared to the “moderately populated” and “urban” counties (Table 5). This was similar to the trend seen in the 2001 CASA. For DTP3, HepB2, and 3-2-2-2 combination, mean immunization coverage rates decreased as the population density in the counties increased. For the 3-2-2-2 combination, the mean immunization coverage rates decreased by 14 percentage points from 84.9% in the “sparsely populated” counties to 70.8% in the “urban” counties.

TABLE 5: Mean Immunization Coverage Rate Among Counties Based on Population Density for the One-Year Old Cohort in Kansas for 2002.

Vaccine	Sparsely Populated	Moderately Populated	Urban
DTP3	85.8%	79.0%	76.8%
Polio2	94.4%	88.8%	90.2%
Hib2	94.6%	87.9%	89.6%
HepB2	94.6%	90.7%	88.1%
3-2-2-2	84.9%	77.5%	70.8%

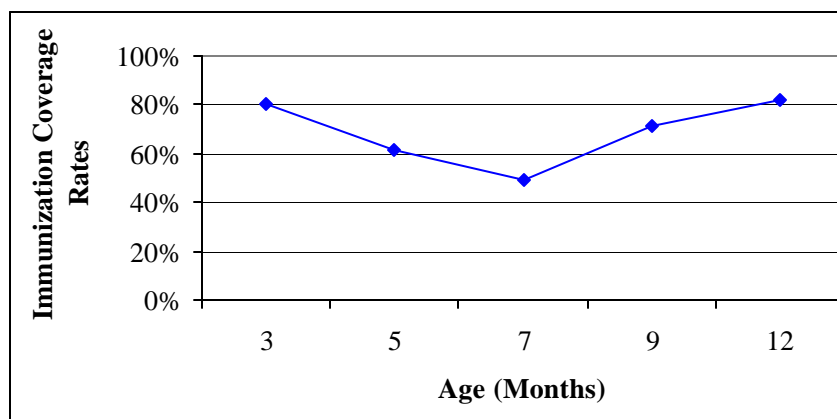
Mean Immunization Rates at Interim Time Points

Like the two-year old cohort, the one-year old cohort immunization coverage levels were assessed at interim months. At 3 months of age, 80% of the children were fully immunized for DTP1, Polio1, Hib1, and HepB1 (Table 6, Figure 4). However, the mean immunization coverage rates decreased by 30 percentage points by 7 months of age where less than half of the children were fully immunized for DTP3, Polio2, Hib2, and HepB2. Finally by 12 months of age, immunization coverage rates returned to levels similar to those at 3 months of age.

TABLE 6: Recommended Vaccines at Each Time Point and Combined Immunization Coverage Rates for One-Year Old Cohort in Kansas for 2002 and 2001.

AGE	ANTIGEN	2002	2001
3 months	DTP1, Polio1, Hib1, HepB1	80.4%	80.1%
5 months	DTP2, Polio2, Hib2, HepB2	61.5%	62.0%
7 months	DTP3, Polio2, Hib2, HepB2	49.2%	50.8%
9 months	DTP3, Polio2, Hib2, HepB2	71.6%	73.5%
12 months	DTP3, Polio2, Hib2, HepB2	82.0%	83.7%

FIGURE 4: Mean Immunization Coverage Rates for One-Year Old Cohort in Kansas at Selected Time Intervals for 2002.



The likelihood of being up-to-date for the 3-2-2-2 combination by 12 months of age depending on the up-to-date status at 3 months of age, was also examined. At 3 months of age, 7599 children were up-to-date for DTP1, Polio1, Hib1, and HepB1. Of those children who were up-to-date at 3 months, 87% (6646 children) were up-to-date at 12 months of age for DTP3, Polio2, Hib2, HepB2. However, only 41% (802) of those children behind schedule were up-to-date at 12 months of age. **This means that children who are on time at 3 months of age are 2.1 times more likely to be up-to-date at 12 months age compared to those children who do not begin the series on time.** ($p < 0.001$)

DISCUSSION

Overall, the number of counties reaching the goal of immunization coverage rates of 90% or better increased for Polio3, MMR1, and Hib3 and remained the same for HepB3. At the same time the number of counties with coverage rates 90% or greater decreased for both DTP4 and the 4-3-1-3-3 combination. As a result, only 28 counties, ten less than last year had coverage rates of at least 90%.

In both age cohorts, mean immunization coverage rates were greatest for those counties who were “sparsely populated” compared to the other two county groupings of population density with the exception of DTP4 and VAR1 in the two-year old cohort. Also in the two-year old cohort, the mean coverage rates in among the “moderately populated” counties were the lowest compared to the other two groups. The greatest difference in the one-year old cohorts was the 3-2-2-2 combination where the mean coverage rates decreased by fourteen percentage points as the population density groups increased from “sparsely populated” to “urban”. Since counties with the greatest concentration of population have lower immunization coverage rates than those counties with less concentration of population, targeting “urban” and “moderately populated” counties to increase coverage rates would reach a greater proportion of children.

Children who start their immunization series on time were compared to children who started late. In the two-year old cohort, children who started on time were 1.9 times more likely to complete the

series by 24 months of age than those who started late. At two-years of age 16% of the children only need one immunization in order to be up-to-date. For those children requiring just one immunization, 88% were missing DTP4. In the one-year old cohort, children who started the immunization series on time were 2.1 times more likely to be up-to-date at 12 months of age than those who started late.

In March 2001, CDC recommended vaccine providers to defer the fourth dose of DTP if they had an insufficient supply to vaccinate infants with the first three doses.¹ This deferral is one possible reason for the DTP4 mean immunization coverage rates to decrease from 86.2% coverage in 2001 to 76.2% coverage in 2002. However, the third dose was still administered according to the recommendations and the mean coverage rate for DTP3 was 96.1% with 96 counties achieving 90% coverage or better.

Several reasons may have contributed to the decrease in DTP4 coverage rates. When immunization coverage rates at interim time points were examined, rates dropped from 64% at 5 months of age to 53% at 7 months of age (Table 2, Figure 2). The only added immunization required at that age was **DTP3**. Since only one immunization was needed parents may have postponed a visit until later when the child was eligible for more immunizations. Children who receive **DTP3** late may not be able to receive **DTP4** on subsequent visits since the minimum interval between the two doses is 6 months.

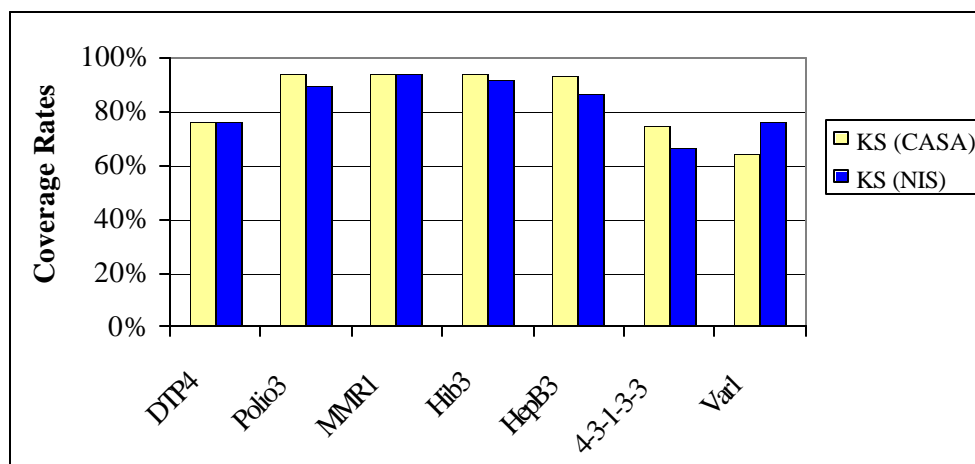
Immunization coverage rates for both DTP4 and consequently 4-3-1-3-3 combination were also affected by the DTP vaccine shortage, which began in the last quarter of 2000 and lasted until the middle of 2002. During this time the forth dose of DTP (DTP4) was to be deferred until the shortages no longer existed. The deferral of the forth dose of DTP is most likely the major factor for the decline of DTP4 coverage rates in 2002. On the other hand, coverage rates of DTP3 among two-year olds were unaffected with 96.1% coverage in 2002 and 96.2% in 2001. Similar results were found among two-year old children in Puerto Rico where DTP4 coverage rates decreased from 95.8% in 2001 to 31.8% in 2002.⁴ Due to this deferral of the forth DTP dose, CDC expects decreases in coverage rates for both DTP4 and the 4-3-1-3-3 combination for the next three years.⁵

The two-year old cohort results for 2002 CASA were compared to the 2002 National Immunization Survey (NIS) results for Kansas and the US, which refers to a similar time period as in this survey.⁶ Despite the 2002 CASA not being a population based survey, coverage rate results are overall similar to the 2002 NIS data for Kansas, which is a population-based sample based on a smaller sample size representing a larger population of children. Immunization coverage rates for the 2002 CASA are greater than the 2002 Kansas NIS data for HepB3 and the 4-3-1-3-3 combination but less for Var1 (Figure 5).

⁵ Impact of Vaccine Shortage on Diphtheria and Tetanus Toxoids and Acellular Pertussis Vaccine Coverage Rates Among Children Aged 24 Months – Puerto Rico, 2002. MMWR 2001;51:667-668.

⁶Data for NIS was collected by the Centers for Disease Control and Prevention (CDC) through a telephone survey of randomly selected households. For accuracy, the healthcare providers (family physicians, pediatricians, etc.) of the children included in the survey were contacted by mail. NIS estimates were calculated using both household and provider data.

FIGURE 5: Comparison of Immunization Coverage Rates in Two-Year Old Between 2002 CASA and 2002 NIS for Kansas.



This study had several limitations. The first was that this was not a population-based study. This study only included children who attended a local health department for at least one of their immunizations and did not include children who attended for any reason, which might have resulted in an overestimation of coverage rates. On the other hand, an underestimation of coverage rates was also possible if immunizations records fail to identify children who have moved or gone elsewhere (MOGE) for immunizations. Immunization records may have been inaccurate as a result of the county health departments using different forms of record keeping.

Despite the limitations, this survey served as an effective tool for assessing immunization coverage rates both at the state level and at the county level. When assessing coverage rates at the county level, the CASA was a useful tool in swiftly identifying problem areas and under immunized children. For these reasons, this assessment will continue to be used to track the increasing immunization coverage rates in Kansas.